



**CONSUMER PROTECTION & SAFETY DIVISION
CALIFORNIA PUBLIC UTILITIES COMMISSION**

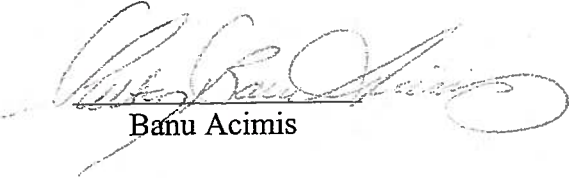
**INCIDENT INVESTIGATION REPORT
ON
RANCHO CORDOVA
EXPLOSION AND FIRE**

San Francisco, California
November 10, 2010

DECLARATION OF BANU ACIMIS

I, Banu Acimis, Utilities Engineer of the Utilities Safety and Reliability Branch of the Consumer Protection and Safety Division, declare that the information contained in the November 10, 2010 "Incident Investigation Report" is true and correct to the best of my knowledge and belief.

Executed under the penalty of perjury on November 10, 2010 in San Francisco, California.


Banu Acimis

STAFF REPORT

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Investigator: Banu Acimis

Incident Number: G20081224-02

Utility: Pacific Gas and Electric (PG&E)

Date and Time of the Incident: December 24, 2008, 1335 hours

Location of the Incident: 10708 Paiute Way
Rancho Cordova, CA
Sacramento County

Summary

On December 24, 2008, at approximately 1335 hours, a house located at 10708 Paiute Way, Rancho Cordova, exploded due to a natural gas leak on PG&E's main gas pipeline. As a result, one person was fatally injured and five people were injured. The explosion and subsequent fire destroyed one house and severely damaged two neighboring houses located at 10712 and 10704 Paiute Way.

PG&E personnel arrived at the incident site about three hours prior to the explosion in response to a complaint of gas odor. The Sacramento Metropolitan Fire District (SMFD) and the Rancho Cordova Police Department (RCPD) responded to the scene shortly after the explosion. The injured people were transported to the University of California (UC) Davis Medical Center by ambulance. Residents living near the incident site were evacuated. PG&E isolated the gas services to the destroyed and damaged houses by squeezing off a 2-inch Polyethylene (PE) gas main pipe. The property damage was approximately \$267,000. (Appendix L)

The Consumer Protection and Safety Division (CPSD) of the California Public Utilities Commission (CPUC) investigated this incident, and actively participated in the National Transportation Safety Board's (NTSB) investigation of the explosion. CPSD's investigation revealed that the incident was caused by gas leaking from a September 2006 pipe repair that did not meet federal and state requirements for pipes transporting gas, and which separated from a mechanical coupling and caused the leak. The leaking gas migrated from the main pipeline into the house located at 10708 Paiute Way which ignited and caused the explosion and fire. CPSD's investigation also found that, prior to the incident, PG&E did not ensure that PG&E's properly trained and equipped personnel arrived timely at the site to investigate the gas leak and to safeguard life and property. This also contributed to the cause of the explosion and loss of life.

Summary of Violations

CPSD's investigation found the following PG&E violations:

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- PG&E violated Title 49, Code of Federal Regulations (CFR) §192.13(c), §192.59(a)(1), and California Public Utilities Code (Pub. Util. Code) §451, because PG&E's installation of a segment of pipe on September 21, 2006 at 10708 Paiute Way, Rancho Cordova was not approved and not permitted for gas usage according to standards specified by ASTM D 2513.
- PG&E violated Title 49, CFR §192.13(c) and Pub. Util. Code §451, because PG&E failed to follow its Utility Operations (UO) Standard S2333 and its Attachment 1-Material Problem Report (MPR) Process Flow Chart. PG&E discovered in November 2006 that it had installed an out-of-tolerance pipe in Elk Grove in October 2006 but took no steps to locate and eliminate hazards originating from other non-conforming pipe that PG&E had already installed. PG&E also failed to take appropriate corrective actions and preventative measures to minimize the risk of similar failures in the future.
- PG&E violated Title 49, CFR §192.13(c) and Pub. Util. Code §451 because the utility failed to take immediate actions to safeguard life and property as required in PG&E's Work Procedure (WP) 6434-01 (effective September 2008) when an outside hazardous leak was suspected. If the location involved in the incident had been properly secured, occupants of 10708 Paiute Way would not have entered the house unseen.
- PG&E violated Title 49, CFR §192.615 (a)(2), (a)(3)(i), (a)(4), (a)(5), (a)(7), (a)(8), and Pub. Util. Code §451, because PG&E's emergency response plans, practices, and procedures were inadequate to prevent the explosion and to protect life and property from actual or potential hazards of gas leaks, and because PG&E failed to coordinate with Fire Department, Law Enforcement, or other agencies to effectively respond to the emergency.
- PG&E violated Title 49, CFR §192.615 (b)(2), and Pub. Util. Code §451, because PG&E failed to "[t]rain the appropriate operating personnel to assure that they are knowledgeable of the emergency procedures and verify that the training is effective."
- PG&E violated Title 49, CFR §199.105(b), §199.225(a), and Pub. Util. Code §451 for not administering drug and alcohol tests for its employees whose performance either contributed to the Rancho Cordova accident or, or whose performance cannot be completely discounted as a contributing factor to the accident.

Fatalities and Injuries¹

1. Deceased: owner of the house at 10708 Paiute Way, Rancho Cordova

¹ Names of the individuals listed under fatalities and injuries are known but not disclosed.

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2. Injured: daughter of the owner of the house at 10708 Paiute Way, suffered numerous 2nd and 3rd degree burns
3. Injured: granddaughter of the owner of the house at 10708 Paiute Way, suffered numerous 2nd degree burns
4. Injured: male resident at 10712 Paiute Way, Rancho Cordova, suffered injuries to the torso, upper body, and right leg
5. Injured: PG&E leak investigator, suffered a laceration, visible burns, and pain to the head
6. Injured: Engineer with the SMFD

Property Damage

Approximately \$267,000.

Utility Facilities Involved

Main gas pipe size: A 1¼-inch PE pipe inserted into a 2-inch PE pipe.

Maximum Allowable Operating Pressure (MAOP): 50 pounds per square inch gauge (psig). Operating Pressure: 47 psig.

Witnesses²

1. PG&E Gas Service Representative/Technician (technician)
2. PG&E Gas Crew Foreman
3. PG&E Flame Ionization Unit Operator (sometimes "leak investigator")
4. PG&E Fieldperson
5. Female resident at 10716 Paiute Way
6. Male resident at 10712 Paiute Way
7. PG&E Senior Gas Engineer
8. PG&E Maintenance and Compliance Superintendent
9. PG&E Sacramento Division Gas Compliance Supervisor
10. PG&E Gas Supervisor
11. PG&E Health & Safety Claims Investigator
12. PG&E Gas Distribution Supervisor
13. PG&E Field Service Supervisor
14. PG&E Manager for Meter Services

² Names of the individuals listed under witnesses are known but not disclosed.

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Evidence

1. PG&E's initial and final incident reports
2. RCPD Investigation Report No: RCPD 2008-0067518
3. Transcripts of interviews conducted on December 31, 2008 and February 5, 2009 led by the National Transportation Safety Board (NTSB)
4. PG&E's responses to data requests
5. Results of the tests conducted at NTSB's laboratories on January 29, 2009, March 11, 2009, and April 13, 2009
6. SMFD Fire Report
7. Letter from US Poly Company to PG&E dated November 9, 2006
8. Letter from JMEagle to PG&E dated April 8, 2009
9. Letter from JMEagle to NTSB dated May 12, 2009

Responding Agencies

1. Rancho Cordova Police Department (RCPD)
2. Sacramento Police Department (SPD)
3. California Highway Patrol (CHP)
4. Sacramento Metropolitan Fire District (SMFD)
5. City of Rancho Cordova (CRC)
6. Sacramento Municipal Utility District (SMUD)

Incident

On December 24, 2008, at approximately 0916 hours, PG&E's Customer Contact Center received a complaint from a resident at 10716 Paiute Way who smelled gas. The customer stated the following: "There is a gas smell outside my house. I smell it when I walk up front and I also smell it in the garage. It is pretty strong. I took my husband to work this morning and as I was driving back home, I smelled it about four houses away. I did not smell it in the garage previously. I am concerned that it is getting worse...". (Appendix H)

A PG&E Gas Service Representative/Technician (technician) arrived on site at approximately 1014 hours in response to the gas odor complaint. PG&E provided the technician with "Sensit Gold" equipment. The technician was not equipped or trained to identify, classify, and assess outdoor leaks. (Appendix D and H) The technician met with the customer who reported the smell of gas. The technician performed a clock test on the gas meter at 10716 Paiute Way to determine if there was excess gas flow into

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the house. The clock test indicated normal flow. She then checked the water box located in front of the house with a "Sensit Gold" combustible gas measurement device and detected the presence of gas. After examining the premises at 10716 Paiute Way for a gas leak, she called PG&E's central dispatch at 1025 hours to request a Flame Ionization Unit (flame pack) operator (leak investigator) to the scene to pinpoint the source of the gas leak. (Appendix H)

PG&E Gas Distribution Supervisor (supervisor) in Sacramento Division received the technician's request for a leak investigator shortly after 1030 hours. He pulled the facilities map (plat sheet) and verified the location of the gas pipeline providing gas to the neighborhood in the vicinity of 10716 Paiute Way. The supervisor called a leak investigator at 1042 hours to check his availability to locate the gas leak with gas detection equipment (flame pack). The leak investigator told the supervisor that he was finishing up a task which involved filling a ditch with soil and removing barricades from an excavation site at 1248 Andalusia Drive, Sacramento and when he completed the task he would go to the Sacramento service center to pick up a flame pack and the case ticket, and then go to the site to leak survey the area. After the supervisor had confirmed with the leak investigator that he would report to the site, the supervisor put the plat sheet that contained the pipeline system in the vicinity of 10716 Paiute Way in leak investigator's inbox. After the supervisor had informed the Sacramento Division Gas Compliance Supervisor (compliance supervisor) that the leak investigator would report to the site to conduct the leak investigation with the flame pack, the supervisor went home for the day. (Appendix C, D, and H)

The technician at the site continued to check the area for a gas leak. She performed a clock test of the meter at 10712 Paiute Way. She also made contact with the resident and entered the house and checked for the presence of gas. She found and repaired a minor leak on the water heater. She smelled gas in a small room in front of the garage and found a trace of gas at the water box located in front of the house. (Appendix C, D, and H)

A male resident who lived at 10712 Paiute Way directed the technician to his neighbor's front yard, at 10708 Paiute Way, where there was a patch of dead grass. Dead grass can be caused by a gas leak. He explained to her that there was a leak present at this location that had been repaired. The resident said that he could smell gas occasionally since the repair. The technician called PG&E's central dispatch at approximately 1032 hours to check the status of her request for a leak investigator to conduct a thorough leak investigation. (Appendix A, C, D, and H)

The technician performed a clock test on the meter at 10708 Paiute Way and observed almost no flow. She knocked on the front door to gain access into the house in order to check the gas level inside, but nobody answered. She detected the presence of gas by the patch of dead grass in the front yard. She recorded approximately 63 percent of the lower explosive limit (LEL) of natural gas, which is equivalent to approximately 3 percent gas-in-air. (Appendix D and H)

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After the technician located the general vicinity of the gas leak, she called dispatch again around 1100 hours to obtain the status of the leak investigator. Then, she called the Sacramento office, to obtain an update on the leak investigator. PG&E's dispatch provided the technician with the leak investigator's name and phone number so that she could make direct contact with him. Then the technician called the leak investigator to ask what time he would be there and he said he would be there before noon. (Appendix D and H)

The technician waited in her vehicle for the crew to arrive at the scene. Her vehicle was parked between 10716 and 10712 Paiute Way on the north side of the street. The technician called the leak investigator again after 1200 hours to check to see if he was coming. He told her that he was coming to the site. The technician did not call the Fire Department or Police to assist her in gaining entry to the house at 10708 Paiute Way because she did not obtain any "good reads" and did not smell a significant amount of gas odor around the house. The technician did not grade any of the leaks that she found. (Appendix D and H)

PG&E's gas leak classifications are as follows: Grade 1 gas leaks are hazardous leaks that represent existing or probable hazards to persons or property and require immediate repair or continuous action until conditions are no longer hazardous. Grade 2+ and Grade 2 gas leaks are non-hazardous to persons or property at the time of detection, but still require a scheduled repair. Grade 2+ gas leaks require a scheduled priority repair within 90 days or less. Grade 2 gas leaks must be repaired within 18 months. Grade 3 gas leaks are non-hazardous at the time of detection and can reasonably be expected to remain non-hazardous. (Appendix H)

The compliance supervisor sited the leak investigator in the Sacramento Yard sometime between 1200 and 1230 hours. He then dispatched a gas crew foreman (foreman) and a fieldperson to the incident site because the leak investigator was still in the Sacramento Yard. (Appendix D)

Shortly before noon, while the technician was waiting in her vehicle for the leak investigator to arrive, the resident who lived at 10708 Paiute Way along with his daughter and granddaughter arrived and entered the house. The granddaughter did not notice any PG&E vehicles when she and her family arrived home. The technician stated that she did not see anyone enter the residence at 10708 Paiute Way. (Appendix A and D)

At approximately 1314 hours, the foreman arrived at the scene. The technician showed him where she detected gas in the water boxes and the small room in front of the garage at 10712 Paiute Way. She also took the foreman to the area of the dead grass in front of the house at 10708 Paiute Way. The technician told the foreman that she could not make contact with the resident at 10708 Paiute Way. After they finished discussing technician's findings, the foreman relieved the technician and she left the site. (Appendix D and H)

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The leak investigator arrived on scene at 1319 hours, two hours and thirty seven minutes after his supervisor directed him to report to the site and about 16 minutes before the explosion. According to the leak investigator's statements, his arrival to the incident location was delayed because of traffic congestion and a brake problem with the truck he was driving. He did not notify dispatch or his supervisor about the problem. Dispatch was made aware of his late arrival when the compliance supervisor saw the leak investigator in the Sacramento Yard between 1200 and 1230 hours. The fieldperson arrived at the scene approximately three minutes after the leak investigator. (Appendix C, D, and H)

The foreman and the field person began locating and marking the gas piping in front of 10712 and 10708 Paiute Way. The leak investigator knocked on the door of 10708 Paiute Way and was greeted by the granddaughter of the home owner. The leak investigator then spoke with the home owner near the garage. After speaking with the home owner, the leak investigator started to leak survey the area with a Heath Detector Pac III (DP3) flame pack. He leak surveyed the gas pipe from 10712 Paiute Way across the property to 10708 Paiute Way. He came to the patch of dead grass and recorded high levels of gas. Then he leak surveyed along the gas service line all the way to the meter at 10708 Paiute Way, but did not detect the presence of gas near the foundation of the house. He turned back and proceeded towards the area where he detected high gas concentrations. When he came close to the dead patch of grass area again, the flame pack flamed-out. The flame-out was an indication of a high concentration of gas in the sample. (Appendix A, C, D and H)

The explosion occurred at approximately 1335 hours, before the leak investigator could find the leak source. Figure 1, titled *Aerial View of Incident Location* shows the location of the gas leak and relationship of all the houses involved in the incident. The ignition source for the explosion appears to be a lighter that the granddaughter "flicked" at the time of the explosion to light a cigarette. (Appendix A and B)

At the time of the explosion, the daughter and the granddaughter of the home owner were in the bathroom while the home owner was outside. The explosion trapped the home owner under the rubble and severely burned him. The daughter and the granddaughter were able to escape from the bathroom through a damaged wall that collapsed from the explosion. (Appendix A)

The Sacramento Metropolitan Fire District (SMFD) responded to the incident within approximately five minutes of the explosion. Upon arrival, firefighters attacked the fire, provided medical assistance to the injured people, and completed primary and secondary searches of the three residences most affected by the explosion. A SMFD Captain requested a second alarm right away, with four extra ambulances. The Captain smelled gas when he arrived at the incident site. He immediately told PG&E personnel that the gas needed to be shut-off to the entire block. At the time, PG&E was already in process of shutting-off the gas. The firefighters extinguished the fire and attended to the injured victims. Figure 2, titled *10708 Paiute Way After Explosion* shows the house and surroundings destroyed by the explosion and fire. (Appendix B)

Figure 1 - Aerial View of Incident Location

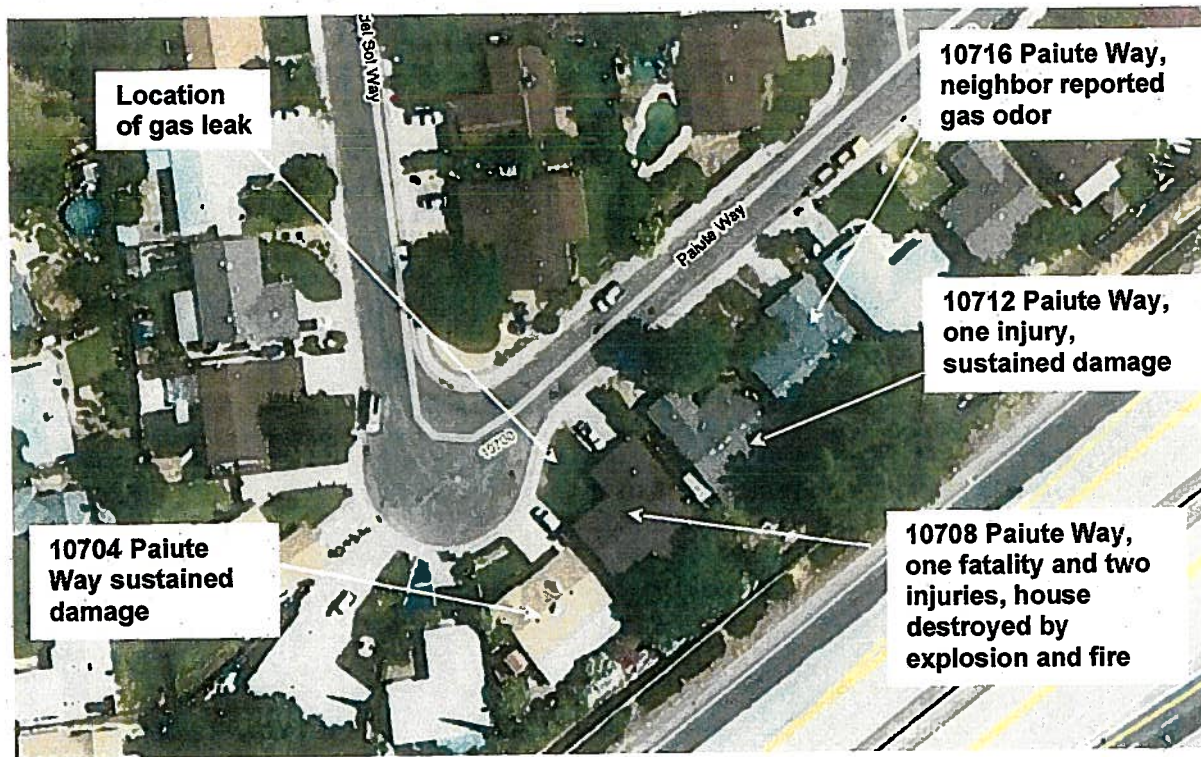


Figure 2 - 10708 Paiute Way After Explosion



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Law enforcement officials from SPD, RCPD, CHP, and CRC responded and assisted in traffic and pedestrian control and evacuation. The streets were cordoned off and residents living within a 10-house perimeter of the explosion site were evacuated. White Rock Road Elementary School was designated as an evacuation center. Medical responders identified a total of six individuals that needed medical assistance. The individuals included a SMFD engineer, a PG&E employee, and residents of the homes affected by the explosion. All victims received care from medical personnel on site and were transported to the UC Davis Medical Center for further treatment. (Appendix A and B)

PG&E shut-off the gas service to the three houses that were damaged by digging two bell holes and squeezing-off the 2-inch plastic pipeline upstream and downstream the houses at 10712 and 10704 Paiute Way, effectively isolating the main pipeline. SMUD shut-off the power to the affected homes. Emergency Response crews from SMUD, PG&E, RCPD, and SMFD remained on scene until approximately 2300 hours. (Appendix A and B)

Appendix M shows a timeline of events that occurred on the incident day.

Investigation

On December 24, 2008, at approximately 1730 hours, CPSP representative Banu Acimis arrived at the incident site, met with PG&E representatives, and conducted an initial field investigation of the incident.

On December 29, 2008, an investigative team that included Karl Gunther of the National Transportation Safety Board (NTSB), Peter Katchmar of the Pipeline Hazardous Materials Safety Administration (PHMSA) of the Federal Department of Transportation (DOT), CPSP representatives Banu Acimis and Raymond Fugere, SMFD, RCPD, CRC, and PG&E, was formed. The investigation team held a series of meetings, conducted witness interviews, and field investigations from December 29, 2008 through January 1, 2009, in Rancho Cordova to determine the cause of the incident. CPSP participated actively in this investigation, including witness interviews and other matters. CPSP also interviewed residents of the area.

According to the witness statements taken from the RCPD's report, the male resident, who lived at 10712 Paiute Way, asked the PG&E technician and the leak investigator on two occasions before the explosion if they were going to evacuate the residence at 10708 Paiute Way, but PG&E implemented no evacuation. (Appendix A)

On December 29, 2008, RCPD interviewed the granddaughter of the home owner. She stated "When we got to my grandpa's house, the smell was really strong outside. We all went inside, where the smell was just as strong." However, in a letter dated February 3, 2009, the granddaughter's attorney stated "They did not smell gas inside the residence prior to the explosion/fire. The PG&E employee came to the door and asked for the home owner. The granddaughter answered the door and did not tell him they smelled gas inside the home. We don't know what conversations may have taken place with the

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home owner. The PG&E employee did not ask her if he could enter the residence and did not enter the residence." She stated to RCPD "As soon as I flicked the lighter, it felt like my hand blew up." (Appendix A)

On December 30, 2008, RCPD interviewed the neighbor, male resident at 10712 Paiute Way. According to the neighbor, the home owner of 10708 Paiute Way experienced a problem with his lawn about two years ago. PG&E found and fixed a gas leak in his yard at 10708 Paiute Way. PG&E put fresh sod down after the repair; however, the grass turned brown and died. The home owner told his neighbor that he had called PG&E on several occasions since the repair in 2006 and that he became so accustomed to the smell that he couldn't smell it anymore. (Appendix A)

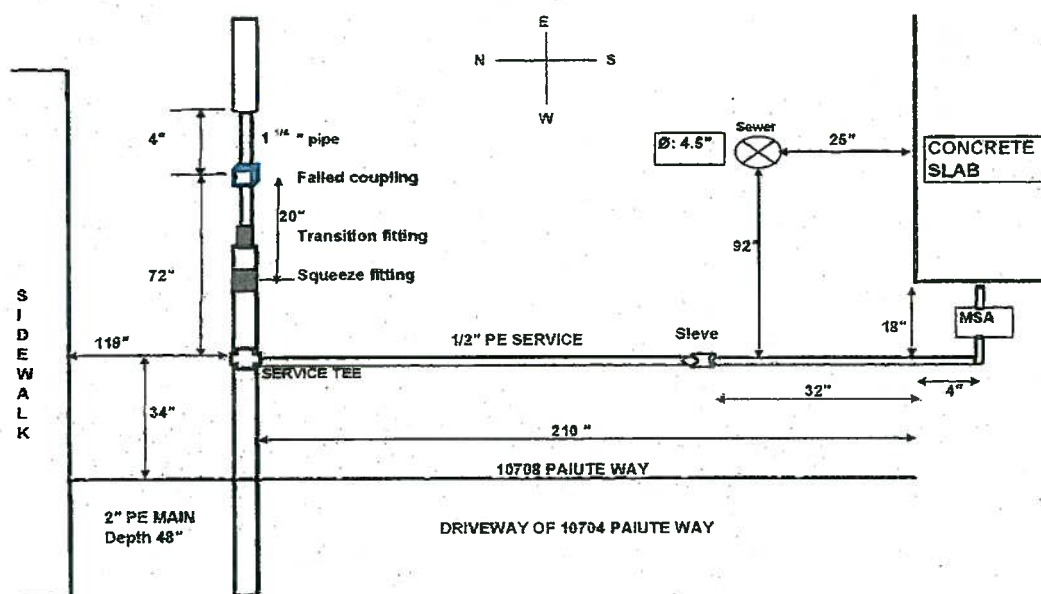
PG&E provided all field orders and service records for the residence located at 10708 Paiute Way, Rancho Cordova since the beginning of 2006. The records showed that there were a total of seven field orders and/or service records that PG&E received and recorded for this residence. The field orders and service requests are listed in Table 1, titled *PG&E Work Orders for 10708 Paiute Way*. (Appendix H)

Table 1 - PG&E Work Order for 10708 Paiute Way

Date	Order	PG&E Responded
8/17/06	Unspecified outside gas leak	8/17/06
9/5/06	Unspecified outside gas leak	9/5/06
9/5/06	Relight pilot	9/5/06
9/14/06	Unspecified outside gas leak	9/14/06
9/21/06	Unspecified outside gas leak	9/21/06
9/6/08	Smart Meter installation contractor could not complete Smart Meter module	9/9/08
12/24/08	Unspecified outside gas leak	12/24/08

On December 29, 2008, PG&E dug a trench, at 10708 Paiute Way where the patch of dead grass was located and exposed a 2-inch plastic main pipeline which consisted of a 2-inch to 1¼-inch transition (reducer) fitting, a short section of 1¼-inch pipe, and a 1¼-inch repair coupling. Figure 3, *Schematic of Incident Piping*, shows the orientation of the main pipe, repair, transition and west reducer coupling, and service line that were exposed.

Figure 3 - Schematic of Incident Piping



On December 29, 2008, PG&E pressure tested the main pipeline and service lines separately with air in order to find the location of the gas leak. During the pressure test the west end of the repair coupling started leaking air excessively that showed the location of the gas leak where a 5.5 inch section of the 1 1/4-inch diameter repair pipe, that was between the repair coupling and reducer coupling, was found almost completely detached as can be seen from Figures 4 and 5, titled *Exposed Piping* and *Piping Removed From Ground* respectively.

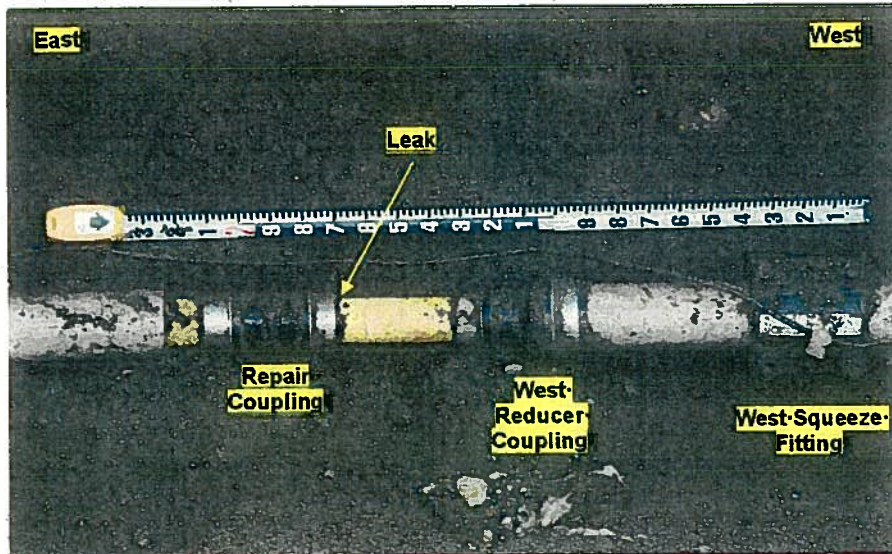
The materials retrieved from the excavation site from east to west shown in Figure 5 are as follows:

- Original 2-inch Aldyl-A PE tan color main pipe (Sample 1)
- Squeeze fitting (east),
- MetFit 2-inch to 1 1/4-inch reducer fitting (east),
- 256-inch section of 1 1/4-inch PE yellow pipe (Sample 2) inserted into the original 2-inch Aldyl-A PE main,
- MetFit 1 1/4 -inch repair coupling where the leak was found,
- Approximately 5.5-inch piece of 1 1/4-inch PE yellow pipe (Sample 3),
- MetFit 1 1/4-inch to 2-inch transition fitting (west),
- Squeeze fitting (west)
- Original 2-inch Aldyl-A PE tan color main pipe.

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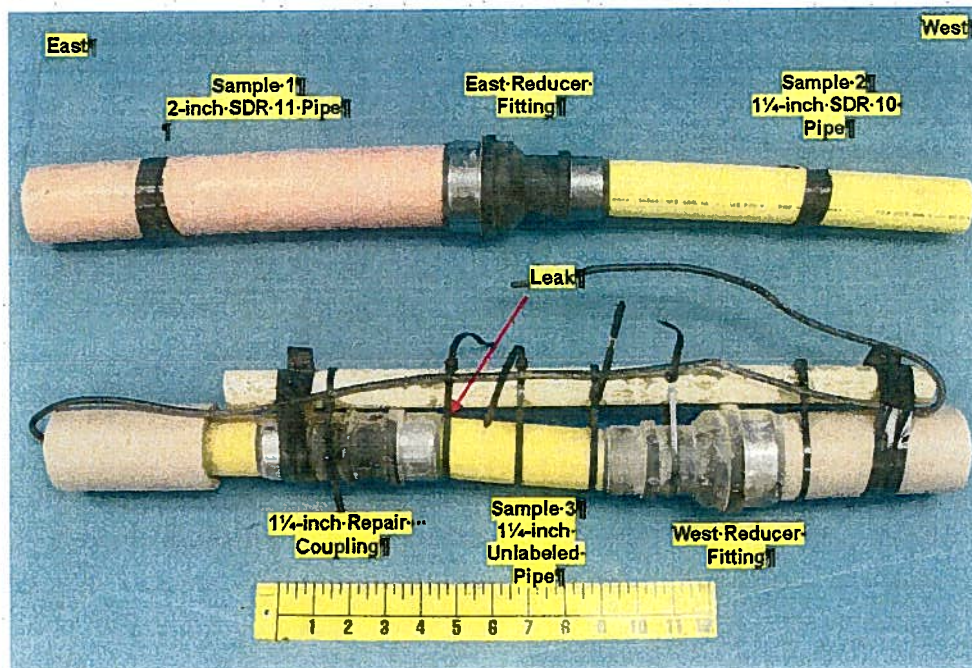
Pipe sections and fittings removed from service were sent to NTSB's laboratory in Washington, D.C. for testing.

Figure 4 - Exposed Piping



PG&E's records showed that the section of pipe involved in the December 24, 2008 Rancho Cordova incident was installed by PG&E on September 21, 2006 to repair a gas leak. (Appendix H)

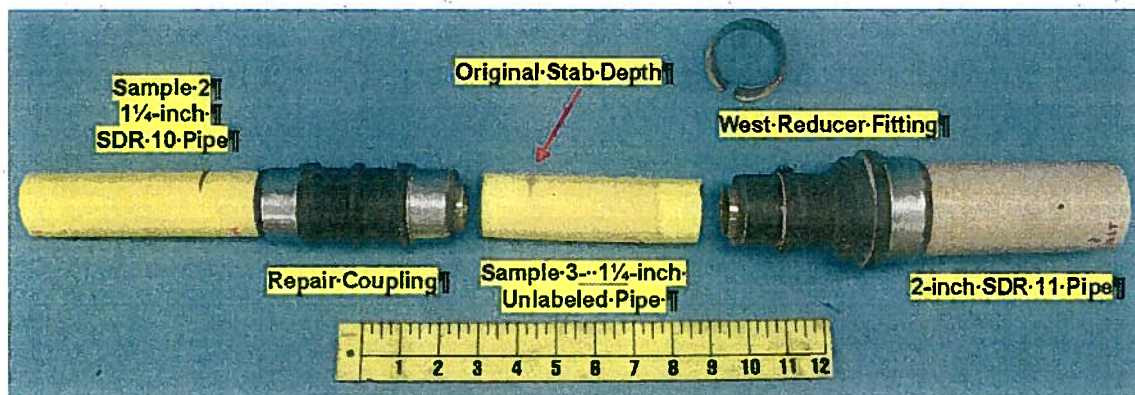
Figure 5 - Piping Removed From Ground



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Figure 6, titled *Close-Up of Failed Pipe*, shows there was a red line on the 1¼-inch yellow pipe between the repair coupling and the west reducer fitting. The red line indicated the original stab depth of the pipe into the repair fitting which was marked by the repairman in 2006 to show how far the end of replacement pipe should be seated inside the coupling. The east end of the short segment of pipe (Sample 3) got separated from west end of the repair coupling and started to leak. (Appendix E)

Figure 6 - Close-Up of Failed Pipe



Gas Leak Repairs at 10708 Paiute Way

According to PG&E leak repair records (Form A), PG&E repaired two gas leaks on the facilities located at 10708 Paiute Way, Rancho Cordova in 2006. (Appendix H)

The first repair (Leak 1) was performed by installing a 1¼-inch Aldyl-A repair cap kit on the half-inch plastic service line to 10708 Paiute Way on September 5, 2006. After the repair was completed, the line was pressure tested at 100 psig for five minutes and no leaks were found. The leak was field reviewed on September 18, 2006. A post repair check for the leak repair was not conducted. (Appendix H)

Another leak (Leak 2) was found on September 15, 2006 on the main pipeline located in front of the house at 10708 Paiute Way. The leak was caused by a crack on the main pipeline due to pressure imposed by tree roots. The gas leak was repaired by PG&E's gas crew foreman on September 21, 2006, by inserting 20 feet of 1¼-inch pipe into the 2-inch diameter main pipeline. After the December 2008 failure, the gas crew foreman claims that on September 21, 2006 he had pressure tested the repair at 100 psig for five minutes. The manufacturing date of the installed pipe was June 5, 2006, and the pipe was Uponor³ TR-418. The gas leak repair was field reviewed on September 22, 2006. A post repair check was not conducted. (Appendix H)

³Uponor is a separate company from which an indirect subsidiary of JM Eagle acquired a polyethylene pipe business in 2004. In connection with the acquisition, the acquiring subsidiary was renamed US Poly and its products have been sold under that name since that time.

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From 2003 to August 2008, PG&E had a sole source material contract with US Poly. The materials used in the repair of Leak 2 in 2006 at 10708 Paiute Way, Rancho Cordova, were US Poly products. US Poly marks its PE pipe intended for gas use with a continuous marking to ensure that the end user knows the specifications of the pipe. (Appendix H)

Gas Leak Repairs at 8101 Consumnes River Boulevard

On October 7, 2006, a PG&E gas crew experienced a material problem when it was repairing a gas leak caused by a third party excavator at 8101 Consumnes River Boulevard, Elk Grove. The PG&E crew used a 1¼-inch PE pipe and MetFit coupling in the repair, but the repair did not hold the pressure and started to leak. PG&E filled out a Gas Material Problem Report (MPR) for the material problem and cut out and sent four 1¼-inch SDR 10 MetFit Couplings and attached piping to US Poly (gas pipe manufacturer), for examination and testing. The pipe samples that PG&E sent to US Poly only contained partial markings and incomplete date stamps "04 06" without the year indicated. (Appendix H)

US Poly tested the pipeline samples received from PG&E and determined that three of the four of 1¼-inch PE pipe samples were out-of-tolerance⁴ and that the MetFIT couplings were within specifications. US Poly also determined that the thicknesses of the 1¼-inch PE pipe samples were less than the lower limits for ASTM D 2513 specification for 1¼-inch SDR 10, which would cause the PE pipe and the MetFIT couplings to not join properly. On November 9, 2006, US Poly reported to PG&E that the couplings were approved for gas usage; however, the pipe segments used in the repair in Elk Grove were not approved for gas usage according standards and the non-conforming pipe segments were the root cause of the failure. (Appendix I)

The American Society for Testing and Materials (ASTM), Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fitting, D 2513 is listed as an accepted specification to manufacture gas plastic piping. ASTM D 2513 specifies outside diameters (OD), minimum wall thicknesses (WT), and tolerances for different grades of plastic pipe used for gas.

Based on US Poly's assessment of the pipeline failure, PG&E measured its entire 1¼-inch PE pipe matching the partial markings located in the Sacramento Yard and truck stocks to identify the batch of the out-of-tolerance pipe. PG&E found no pipe sections that were not within specification. PG&E did not know if some of the out-of-tolerance pipe was shipped to other areas within PG&E's territory because its shipping records did not include the manufacture date or the quantity of pipe that was received. Even though PG&E did not ascertain with certainty whether any of the unapproved pipe for gas service found at 8101 Consumnes River Boulevard had been used elsewhere in its system, it concluded that the pipeline failure was an isolated event and did not take any further actions to investigate. (Appendix H)

⁴ Out-of-tolerance means outside the limits specified by the standard. In this case, wall thickness measurement was less than the lower limit specified by the standard for this size of pipe.

PG&E did not replace the other segments of pipe at 8101 Consumnes River Boulevard that were out-of-tolerance. PG&E left the improper pipe in the ground and completed the repairs with two 1¼-inch socket fusion couplings and approximately 51 inches of 1¼-inch PE gas pipe. (Appendix H)

After PG&E discovered the problem with the out-of-tolerance PE pipe, it did not file a claim with US Poly regarding the thin walled PE pipe in order to further investigate and minimize the risk of similar failures in the future. (Appendix J)

Post Incident Investigations

After the incident occurred on December 24, 2008, PG&E made an attempt to locate repairs made with MetFit couplings and pipe specifically marked with the partial date stamp of "04 06". PG&E could not readily identify locations where such repairs were made. Therefore, PG&E decided to expand its investigation to include all repairs conducted between 2004 and 2008 that involved the use of 1¼-inch US Poly pipe and MetFit couplings. (Appendix H)

Initially, PG&E determined three locations to excavate that involved repairs made on 1¼-inch PE pipe near the time the September 2006 repair was made at 10708 Paiute Way in Rancho Cordova. These repairs involved the same construction crew and/or work truck. The pipeline locations were:

1. 8101 Consumnes River Boulevard, Elk Grove: The repair pipe section, identified Socket Fusion Piece 1 (Sample 6) and 2, were sent to the NTSB for testing and the test results are given in Table 3. The pipe was embossed with the specifications.
2. 4791 Pell Drive, Sacramento: The pipe was embossed with the specifications and wall measurements were within specifications.
3. 2818 E Street Sacramento: No unmarked pipe was identified at this location. This repair did not require the installation of pipe but rather was made by installing a MetFit repair coupling.

PG&E refined the excavation protocol to expand the search throughout its service territory and included repairs and replacement that involved 1¼-inch PE pipe and MetFit couplings which were completed from 2003 through 2009. A total of 37 locations were identified. As a result of the excavations completed in the Sacramento Division, all 1¼-inch PE pipe sections were replaced and no non-compliances were identified except for the out-of-tolerance pipe segments found at 8101 Consumnes River Boulevard, Elk Grove. (Appendix H)

Packing Pipe and Stub Markers

On February 19, 2009, CPSD representative Banu Acimis, together with a PG&E representative conducted a field visit and examination of PG&E's Sacramento yard. Ms. Acimis discovered two unmarked pieces of PE yellow pipe in a bin marked "Stub

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Markers Only” at PG&E’s Sacramento Division Maintenance Yard, shown in Figure 7, title *Stub Marker Bins*. Because the PG&E pipe that failed in 2008 in Rancho Cordova was also unmarked, CPD provided the information to Mr. Gunther of NTSB and the pipe segments were sent to NTSB’s laboratory for testing. According to PG&E’s explanation and CPD’s investigation, for a significant time period, the Sacramento Division had a practice of using scrap pieces of pipe which were stored in Stub Marker Bins to mark the ends of gas service stubs. The repairman who performed the pipeline repair at 10708 Paiute Way, Rancho Cordova in 2006, confirmed this practice. The packing pipe, shown in Figure 8, titled *Stack Piping Used To Support Pipeline Coils*, was used to stabilize the stack and protect the pipe coil. The packing pipe was typically disposed of in a trash bin when PG&E received the shipment at the local headquarters. (Appendix D and H)

Figure 7 - Stub Marker Bins

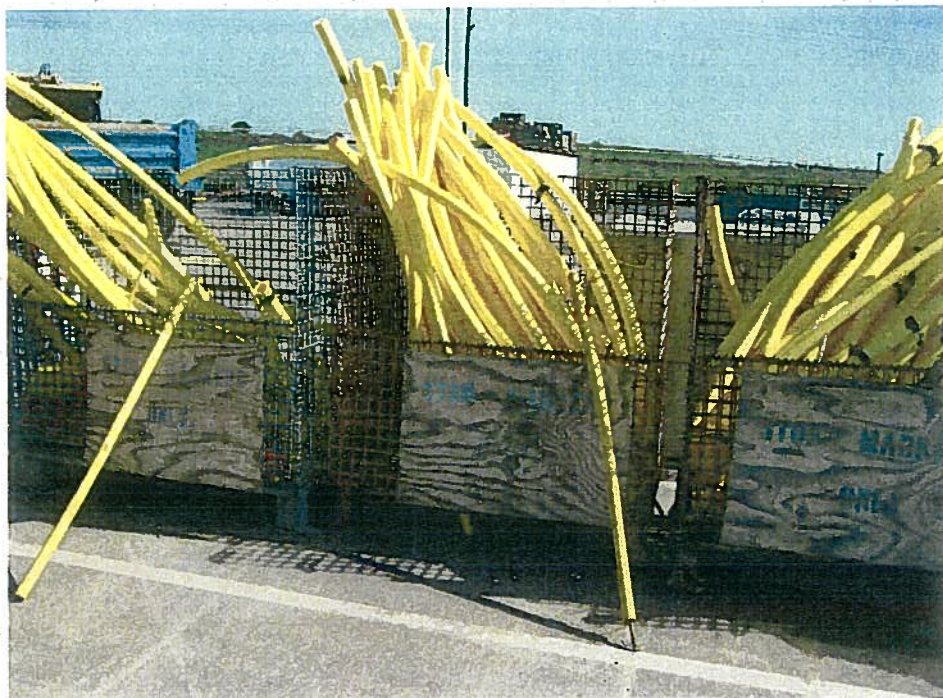


Figure 8 - Stack Piping Used To Support Pipeline Coils

Four vertical segments of stack piping used to support the pipeline coil during transport to PG&E



According to JMEagle (formerly US Poly and Uponor), the pipeline manufacturer, the stack piping used to stabilize the coils (silo) of plastic pipe, is made from the same resin and on the same equipment as the plastic pipe approved for gas usage. They are produced during the start up process before the product achieves the required dimensions. They are produced with no markings in order to make the packaging pipe segments distinguishable from the finished specification pipe product so that they would not be mistakenly installed. The stack piping is not intended to be used to transport gas because its specifications do not match the ASTM D 2513 standards. Therefore, it is unlawful to use the stack piping to transport gas. (Appendix K)

NTSB Pipeline Testing

On January 29, 2009 and March 11, 2009, Carl Schultheisz, a Material Research Engineer from NTSB conducted testing on the gas piping involved in the incident and similar pieces of piping that were used at other locations. A piece of the scrap "stack" piping from the Sacramento Yard was also tested. The results of the tests conducted can be found in Materials Laboratory Factual Report (MLFR) Numbers 09-010 (January 29, 2009, tests) and 09-021 (March 11, 2009, tests). Table 2, titled *NTSB Samples*, describes the samples that were tested. (Appendix E and F)

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Mr. Shultheisz, measured the OD and WT and examined all pieces for markings⁵. Table 3, titled *Lab Measurement Results*, shows the measurements documented during the examination and the related required values according to ASTM D 2513.

Table 2 - NTSB Test Samples

Sample	Description
1	2-inch pipe, tan color, located on the east side of the east reducer fitting from the Rancho Cordova incident location
2	1¼-inch SDR ⁶ 10 pipe that was attached to the east side of the coupling from the Rancho Cordova incident location
3	1¼-inch unlabeled piece of pipe which was between the repair coupling (MetFit) and the west reducer coupling from the Rancho Cordova incident.
4	1¼-inch pipe removed from the service at 8101 Consumnes Boulevard, Elk Grove on October 7, 2006
5	MetFit Coupling with small section of pipe inserted in each end removed from service at 8101 Consumnes River Boulevard, Elk Grove on October 7, 2006.
6	1¼-inch pipe part of Socket Fusion Piece 1' removed from service at 8101 Consumnes Boulevard, Elk Grove on February 11, 2009
7	1¼-inch pipe from Sacramento Yard Stub Marker Bin

Table 3 - Lab Measurement Results

Pipe ID	Markings	OD (inches)	Required OD (inches)	WT (inches)	Required WT (inches)
Sample 1	ASTM D 2513 2" IPS ⁸ SDR11 DUPONT	2.388-2.390 Not within limits	2.369-2.381	0.222-0.232 Within limits	0.216-0.242
Sample 2	1¼" IPS SDR 10 – US POLY UAC 2000-- FOR GAS ONLY	1.658-1.661 Within limits	1.655-1.665	0.172-0.176 Within limits	0.166-0.186
Sample 3	No printing or indented lettering was observed	1.662 Within limits	1.655-1.665	0.144--0.152 Not within limits	0.166-0.186
Sample 4	FOR GAS ONLY --- - PE 24(0)	1.650 Not within limits	1.655-1.665	0.146 – 0.152 Not within limits	0.166-0.186
Sample 5	OR UAC 2000 == FOR GAS ONLY	1.666 Not within limits	1.655-1.665	0.141-0.146 Not within limits	0.166-0.186
Sample 6	AS ONLY ---- PE 2406 CEC ----	1.660 Within limits	1.655-1.665	0.145-0.153 Not within	0.166-0.186

⁵ ASTM D 2513, 7. Marking requires that "All required marking shall be legible, visible, and permanent... These markings shall consist of the word GAS, the designation ASTM D2513, the manufacturer's name or trademark, the normal pipe size including the sizing system used (IPS, CTS or OD), DR or minimum wall thickness, material designation, and date of manufacture."

⁶ Standard Dimension Ratio which is the ratio of the outer diameter of pipe to the wall thickness.

⁷ This sample was part of the final repair and left in service until excavated in February 2009.

⁸ IPS stands for Iron Pipe Size.

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	ASTM D 2513 ---- T04 - 0			limits	
Sample 7	No printing or indented lettering was observed	1.661 Within limits	1.655-1.665	0.113 - 0.121 Not within limits	0.166-0.186

The test results showed that the OD measurements of Samples 1, 4, and 5 were not within the acceptable range specified by ASTM D 2513. The WT measurements of Samples 3, 4, 5, 6, and 7 were less than the lower limit for 1¼-inch IPS SDR 10 specified by ASTM D 2513. Test results also revealed that there were no markings that were required by ASTM D 2513 observed on Samples 3 and 7. (Appendix E and F)

On April 13, 2009, the density and Melt Flow Index Analyses of Samples 3, 4, and 7 described in Table 2 were conducted at the Gas Technology Institute Laboratories. The test results were published in MLFR No. 09-024. The test results indicated that the unmarked pipe section (Sample 3), which was separated from the MetFIT coupling in the Rancho Cordova incident, had the exact same density, 0.9382 g/cm³, as the piece of pipe tested from the Stub Marker Bin in the Sacramento Division Maintenance Yard (Sample 7), and 8101 Consummes Boulevard, in Elk Grove (Sample 4). In other words the pipes used in Elk Grove and Rancho Cordova repairs were unlawful for PG&E to transport gas. The specified density for 2006 UAC 2000 pipe that was determined by the manufacturer ranged from 0.937 to 0.943 g/cm³. Density measurements showed that all three samples were within the specified range. (Appendix G)

PG&E's Plastic Pipe Joining Procedures Before Incident

PG&E's standard A-93, Polyethylene Pipe Specifications and Design Considerations, provides information on the size and wall thickness of PE pipe approved for use in the PG&E system. PG&E Gas Standard A-93.1, Plastic Gas Distribution System Construction and Maintenance, requires that all employees involved in the installation of PE pipe must verify the markings on the pipe, the date the pipe was manufactured, and the manufacturer's name prior to installation. Furthermore, PG&E Gas Standard A-93.1 requires that PG&E personnel document this information on the PG&E repair or as-built forms. PG&E also requires employees to log the pipe manufacture date on various documents such as Form A, as-built drawings, and service orders. PG&E personnel are required to review the relevant documents to ensure that the manufacture date of each pipeline has not exceeded PG&E's pipe expiration requirements. (Appendix H)

US Poly MetFit Mechanical Fittings Installation Instructions for Repair Coupling 1¼-inch IPS x 0.166-inch warning states that before beginning procedure, confirm the pipe is 1¼-inch IPS x 0.166-inch wall (SDR 10). The warning also states "the fitting WILL NOT WORK with SDR 9.3 (0.178-inch wall) or SDR 11 (0.151-inch wall) pipe". (Appendix H)

US Poly Company MetFit Mechanical Fittings Installation Instructions for Repair Coupling, Warning states: "Before beginning installation, confirm that the pipe sizes and wall thickness (SDR) exactly match what is marked on the coupling or bag packaging. DO NOT USE WITH ANY OTHER PIPE SDR." (Appendix H)

According to Title 49 CFR §192.283(c), a copy of each written procedure being used for joining plastic pipe must be available to the persons making and inspecting joints.

PG&E Pipeline Investigation Procedures

PG&E's UO Standard S2333 and its Attachment 1-MPR Process Flow Chart requires that the following be conducted when a material problem is identified:

- Initiate corrective action
- Identify failure trends
- Correct undesirable operation and installation procedures
- File a claim with the manufacture
- Remove or replace failed material

UO S2333 also states that the evaluator is responsible for determining the type and extent of the problem; leading and completing the evaluation, reviewing and analyzing data and trends, and providing feedback to the operating departments as necessary. (Appendix H)

PG&E Emergency Plan and Evacuation Procedures

PG&E's Gas Emergency Plan (GEP) states "We will respond and make the situation safe. The company's top priority is to assure our customers that we are concerned about their physical safety and want to make the situation as safe as possible. (Appendix H)

The GEP also describes the specific duties of GSRs who are generally the first company representative on the scene to assess, develop, and implement response plans. According to the GEP, the first responsibility of the GSR is to protect life and property. If unable to do so, the representative must immediately call for assistance. After the area is secure, the representative assesses the situation and determines the necessary response. (Appendix H)

Additionally, PG&E's WP 6434-01 Gas Leak and Odor Investigation Procedure which was effective on December 24, 2008 (issued September 2008) describes the criteria for determining and conducting the appropriate gas leak investigation method for gas leak and odor complaints and responsibilities of the Field Service (FS) employees to ensure customer and public safety. PG&E's Utility Operations (UO) S6434 Gas Leak and Odor Response standard defines the term "Field Employees" as service mechanics, GSRs, and any other gas classifications appropriately qualified to perform this work. (Appendix H) NTSB and CPUC refer to such employees as technicians. (Appendix L)

WP 6434-01, Item-9.C: Gas Leak Test Using a Combustible Gas Measurement Instrument states that "Field Service employees must take the following actions when using a combustible gas measurement instrument to test for a gas leak: If the gas leak is hazardous, or could become hazardous, notify Dispatch Operations in the RMC

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immediately if additional resources are needed (e.g., send a crew, leak surveyor, supervisor, or public agency such as the fire department or police). The Field Service employee must also call the PBX Field Helpline at 1-415-973-7000 and initiate an OM&C Gas Leak Referral case. Record the gas leak referral reason, Case ID number, and the PBX CSRs Corp ID on the Field Order (i.e., strong gas readings at foundation, stood by for M&C crew, Case #012345678, PBX CSR ID ABC1.). The field employee stands by with the customer until construction personnel respond, and provides a Service Report Form to the customer listing the Case ID number. The Field Service employee may also need to take further immediate actions to safeguard life and property (e.g., evacuating building, ventilating buildings, shutting off curb valves, securing the site from foot traffic)." (Appendix H)

Drug and Alcohol Testing of PG&E Employees

PG&E decided not to administer post accident drug and alcohol tests for any of the employees who were involved in the natural gas leak incident on December 24, 2008 at 10708 Paiute Way, Rancho Cordova. The following is PG&E's statement:

"Neither the Gas Service Representative nor any of the crew members who responded to the scene were administered drug and alcohol tests.

Based upon feedback from the local supervisor regarding the Gas Service Representative's (GSR) actions taken prior to the accident, the department manager concluded that the GSR's performance was not a contributing factor in the accident because (1) the GSR followed work procedures as outlined and (2) the GSR was 20 minutes removed from the site at the time the accident occurred.

Based upon feedback from local supervisors and direct observation of the crew members, the on site department superintendent concluded that their behavior was not impaired and their performance was not a contributing factor to the accident because the explosion occurred shortly after their arrival and they had not initiated any action that could have contributed to the incident." (Appendix H)

Preliminary Statement of Pertinent General Order, Public Utilities Code Requirements, and/or Federal Requirements:

State of California Public Utilities Code (Pub. Util. Code) §451

Section §451 states that "Every public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities, including telephone facilities, as defined in Section 54.1 of the Civil Code, as are necessary to promote the safety, health, comfort, and convenience of its patrons, employees, and the public."

Title 49 Code of Federal Regulations (CFR) §192.13 General

§192.13(c) states that "Each operator shall maintain, modify as appropriate, and follow the plans, procedures, and programs that it is required to establish under this part."

Title 49 CFR §192.59 Plastic Pipe

§192.59(a)(1) requires that new plastic pipe is qualified for use if it is manufactured in accordance with a listed specification.

Title 49 CFR §192.615 Emergency Plans

- a) Each operator shall establish written procedures to minimize the hazard resulting from a gas pipeline emergency. At a minimum, the procedures must provide for the following:
 - (1) Receiving, identifying, and classifying notices of events which require immediate response by the operator.
 - (2) Establishing and maintaining adequate means of communication with appropriate fire, police, and other public officials.
 - (3) Prompt and effective response to a notice of each type of emergency, including the following:
 - (i) Gas detected inside or near a building.
 - (ii) Fire located near or directly involving a pipeline facility.
 - (iii) Explosion occurring near or directly involving a pipeline facility.
 - (iv) Natural disaster.
 - (4) The availability of personnel, equipment, tools, and materials, as needed at the scene of an emergency.
 - (5) Actions directed toward protecting people first and then property.
 - (6) Emergency shutdown and pressure reduction in any section of the operator's pipeline system necessary to minimize hazards to life or property.
 - (7) Making safe any actual or potential hazard to life or property.
 - (8) Notifying appropriate fire, police, and other public officials of gas pipeline emergencies and coordinating with them both planned responses and actual responses during an emergency.
 - (9) Safely restoring any service outage.
 - (10) Beginning action under Sec. 192.617, if applicable, as soon after the end of the emergency as possible.
- (b) Each operator shall:

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- (1) Furnish its supervisors who are responsible for emergency action a copy of that portion of the latest edition of the emergency procedures established under paragraph (a) of this section as necessary for compliance with those procedures.
 - (2) Train the appropriate operating personnel to assure that they are knowledgeable of the emergency procedures and verify that the training is effective.
 - (3) Review employee activities to determine whether the procedures were effectively followed in each emergency.
- (c) Each operator shall establish and maintain liaison with appropriate fire, police, and other public officials to:
- (1) Learn the responsibility and resources of each government organization that may respond to a gas pipeline emergency;
 - (2) Acquaint the officials with the operator's ability in responding to a gas pipeline emergency;
 - (3) Identify the types of gas pipeline emergencies of which the operator notifies the officials; and
 - (4) Plan how the operator and officials can engage in mutual assistance to minimize hazards to life or property.

Title 49 CFR §199.105, Drug Tests Required

Each operator shall conduct the following drug tests for the presence of a prohibited drug:

(b) Post-accident testing. As soon as possible but no later than 32 hours after an accident, an operator shall drug test each employee whose performance either contributed to the accident or cannot be completely discounted as a contributing factor to the accident. An operator may decide not to test under this paragraph but such a decision must be based on the best information available immediately after the accident that the employee's performance could not have contributed to the accident or that, because of the time between that performance and the accident, it is not likely that a drug test would reveal whether the performance was affected by drug use.

Title 49 CFR §199.225 Alcohol Tests Required

Each operator shall conduct the following types of alcohol tests for the presence of alcohol:

(a) Post-accident. (1) As soon as practicable following an accident, each operator shall test each surviving covered employee for alcohol if that employee's performance of a covered function either contributed to the accident or cannot be completely discounted as a contributing factor to the accident. The decision not to administer a test under this section shall be based on the operator's determination, using the best available information at the time of the

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determination that the covered employee's performance could not have contributed to the accident.

(2)(i) If a test required by this section is not administered within 2 hours following the accident, the operator shall prepare and maintain on file a record stating the reasons the test was not promptly administered. If a test required by paragraph (a) is not administered within 8 hours following the accident, the operator shall cease attempts to administer an alcohol test and shall state in the record the reasons for not administering the test.

(3) A covered employee who is subject to post-accident testing who fails to remain readily available for such testing, including notifying the operator or operator representative of his/her location if he/she leaves the scene of the accident prior to submission to such test, may be deemed by the operator to have refused to submit to testing. Nothing in this section shall be construed to require the delay of necessary medical attention for injured people following an accident or to prohibit a covered employee from leaving the scene of an accident for the period necessary to obtain assistance in responding to the accident or to obtain necessary emergency medical care.

Conclusion

The cause of the gas explosion and fire was the gas leak on the main PE gas pipe located in the front yard of 10708 Paiute Way, Rancho Cordova. The gas leak was caused when a segment of yellow 1¼-inch IPS PE pipe separated from a 1¼-inch IPS coupling. The 1¼-inch pipeline and coupling were installed on September 21, 2006 to repair a gas leak. The pipeline installed was not approved for gas usage according to ASTM D 2513 standards. The leaking gas migrated into the house at 10708 Paiute Way, ignited and caused the explosion and fire. CPD also found that PG&E had inadequate rules or implementation of the rules to timely deal with a gas leak such as occurred in Rancho Cordova, so as to promptly find and assess the leak and to prevent harm to life and property.

CPD's investigation found that PG&E violated the following:

Violations:

- 1. Title 49, CFR §192.13(c), General, CFR §192.59(a)(1), Plastic Pipe, and Pub. Util. Code §451:**

PG&E failed to follow its standards A-93 and A-93.1 to confirm that the marking on the pipe that was used between the repair coupling and the reducer fitting was consistent with its procedures.

Key facts: (Key facts are not inclusive of all facts that support violations.)

- NTSB's test results demonstrate that the segment of pipe that was installed on September 21, 2006 at 10708 Paiute Way, Rancho Cordova, was not approved for gas usage.
- The pipe PG&E installed had a minimum wall thickness less than the lower limits specified by the applicable federal and state standards, rules, and regulations.
- PG&E's pipe had no markings as were required by federal and state standards, rules, and regulations.
- The non-conforming pipe segment was the cause of the leak and the explosion.

2. Title 49 CFR §192.13(c) and Pub. Util. Code §451:

PG&E violated Title 49 CFR §192.13(c) and Pub. Util. Code §451 because PG&E failed to follow its UO Standard S2333 that requires PG&E to initiate an investigation, identify failure trends, correct any undesirable operating and installation procedures, file a claim with the manufacture company, provide early warning of problem areas, and remove and replace failed material after the defective material was identified. PG&E failed to take any corrective actions and preventative measures to minimize the risk of similar failures in the future, such as occurred on December 24, 2008 in Rancho Cordova. If PG&E had excavated recent installations of similar size pipes in the Sacramento area, Rancho Cordova installation of a non-conforming pipe probably would have been discovered.

Key facts:

- On October 7, 2006, PG&E installed a gas pipe which failed the pressure test after installation in Elk Grove.
- PG&E sent the failed pipe section to the manufacturer for testing.
- On November 9, 2006, the manufacturer informed PG&E that the pipe was non-conforming according to federal and state standards, rules, and regulations.
- PG&E's records did not provide manufacture date to identify PG&E installed pipes similar to those failed in Elk Grove.
- PG&E did not replace the non-conforming pipe in the ground in Elk Grove but instead completed repairs with the non-conforming pipe.
- PG&E did not file a claim with manufacturer regarding the non-conforming pipe.
- Between November 2006 and February 2009, PG&E did not excavate any installations in the Sacramento area to search for similar size and type of non-conforming pipe installed close to the same time frame as Elk Grove.

3. Title 49 CFR §192.13(c) and Pub. Util. Code §451:

PG&E violated Title 49 CFR §192.13(c) and Pub. Util. Code §451 because PG&E failed to follow its procedure WP 6434-01, Gas Leak and Odor Investigation (effective September 2008) which required field service employees to safeguard life and property when an outside hazardous leak is suspected. If the leak site had been properly secured the residents of 10708 Paiute Way would not have entered the house unseen.

Key facts:

- The technician did not see the residents of the house return to the house about noon.
- The residents of the house did not notice any PG&E personnel or vehicles at the site.

4. Title 49, CFR §192.615 (a)(3)(i), (a)(4), (a)(5), (a)(7) and Pub. Util. Code §451:

PG&E violated CFR §192.615 (a)(3)(i), (a)(4), (a)(5), (a)(7) and Pub. Util. Code §451, because PG&E did not establish "(a)...written procedures to minimize the hazard resulting from a gas pipeline emergency..", and PG&E failed to establish "... (3) [p]rompt and effective response to..." "(i)[g]as detected inside or near building", and PG&E failed to provide "(4)[t]he availability of personnel, equipment, tools, and materials, as needed at the scene of an emergency", "(5) [a]ctions directed toward protecting people first and then property...", and "... (7) [m]aking safe any actual or potential hazard to life or property."

a. PG&E violated CFR §192.615 (a)(3)(i), (a)(4), (a)(5), (a)(7) and Pub. Util. Code §451, because PG&E did not have written procedure and practice which allowed technicians to locate and classify outdoor leaks when they respond to gas leak calls.

Key facts:

- PG&E's technician who responded the gas leak call in the morning of December 24, 2008 was neither qualified nor equipped to locate and classify outdoor leaks.
- On the day of the explosion, PG&E provided no person or equipment for locating and classifying a suspected outdoor leak for more than 4 hours after a customer complaint of a strong outdoor gas odor.

b. PG&E violated CFR §192.615 (a)(3)(i), (a)(4), (a)(5), (a)(7), and Pub. Util. Code §451, because PG&E did not have procedures to address situations in which a leak investigator, who was engaged in another work activity that could impede a timely response to an emergency, a means to prioritize the work, and respond to the emergency in a prompt manner. PG&E failed to have procedures that clearly

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define such situations and to direct personnel to respond to emergencies in a prompt and effective manner.

Additionally, PG&E did not have written procedure and practice which required the leak investigator to notify the dispatch and his supervisor immediately of any circumstances that may prevent the leak investigator to respond to a hazardous leak in a timely manner.

CPSD concludes that PG&E did not have adequate procedures addressing "[p]rompt and effective response". PG&E failed to ensure that gas service employees respond timely and effectively to hazardous gas leaks. PG&E also failed to develop procedures that clearly define the actions personnel must take in communicating their availability to effectively respond to emergencies.

CPSD also concludes that if a qualified PG&E leak investigator had promptly responded to the leak, the explosion and loss of life would have been prevented.

Key facts:

- The leak investigator told the supervisor that he was finishing up a task which involved filling a ditch with soil and removing barricades from an excavation site.
- The leak investigator said that when he finished the task and would go to the Sacramento service center to pick-up a flame pack and ticket and then go to the site to survey the area.
- PG&E's technician called PG&E multiple times to request a qualified leak investigator at the site and to obtain and check estimated time of arrival of the leak investigator.
- PG&E's leak investigator arrived on site two hours and thirty seven minutes after he was dispatched.
- The leak investigator failed to inform dispatch and the supervisor about his delay in arrival.
- PG&E's rules and procedures did not require the leak investigator to notify the dispatch and the supervisor immediately of any circumstances that may prevent the leak investigator to respond to a hazardous leak in a timely fashion.
- The leak investigator was the only PG&E personnel at the site qualified and equipped to perform an outdoor leak investigation.
- The leak investigator arrived at the site 16 minutes before the explosion.

c. PG&E violated Title 49 CFR §192.615 (a)(3)(i), (a)(4), (a)(5), (a)(7) and Pub. Util. Code §451, because PG&E's standards and emergency response procedures which were effective on December 24, 2008 were inadequate. PG&E

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did not require employees to warn residents of the danger of leaks such as occurred at 10708 Paiute Way, Rancho Cordova. If such warning had been placed on all accessible entrances to the house before the residents arrived, it would have warned the residents about the danger of the suspected leak.

Key facts:

- PG&E's technician called PG&E multiple times to request outdoor leak investigator and expressed that "she had become increasingly concerned about the leak..."
- PG&E's technician knocked on door at 10708 Paiute Way and received no response.
- PG&E's technician placed no written warning, such as barrier tape or notices, to warn absent homeowners that the house was dangerous because of leaking gas.
- PG&E's technician did not notice anyone enter the house at 10708 Paiute Way at about noon.
- The occupants of the house were not aware of the existence of hazardous gas leak located in the front yard.
- PG&E had no procedure for gas technicians to follow to ensure public safety if the gas flow at the meter is found normal but a hazardous outdoor leak is suspected.

5. Title 49, CFR §192.615 (a)(2), (a)(5), (a)(7), (a)(8) (b)(2) and Pub. Util. Code §451:

PG&E violated Title 49 CFR §192.615 (a)(2), (a)(5), (a)(7), (a)(8), (b)(2) and Pub. Util. Code §451, because PG&E's emergency response procedures were inadequate in defining criteria that require prompt evacuation of buildings, shutting off gas lines, and contacting Fire Department, Law Enforcement or other agency notification to request an assistance in evacuations, traffic control, and public control or other actions directed toward protecting people and property when an outside hazardous leak is suspected.

Key facts:

- A PG&E technician detected leaking gas near dwellings.
- The PG&E's technician at the site did not contact the Fire department, Police department, or any other emergency response agency, at any time during her examination of the site.
- No PG&E personnel contacted the Fire department, Police department, or any other emergency response agency, before the explosion.
- No PG&E personnel took actions to evacuate or secure the area from the presence of people.

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- After a resident opened the door to PG&E's leak investigator, the leak investigator did not ask permission to go inside to check for the presence of gas, and did not advise the residents to leave the house.
- PG&E's gas emergency procedure did not define criteria that require prompt evacuation of buildings and other safeguarding of life and property.
- PG&E's gas emergency procedure did not identify criteria for PG&E employees to notify emergency agencies such as Fire Department, Police Department
- PG&E procedures did not require PG&E communication with Fire Department, Law Enforcement, or other public officials to obtain assistance, under the conditions known at Rancho Cordova on December 24, 2008.
- PG&E provided no training for first responders to locate and classify outdoor leaks.
- PG&E provided no training that required employees to undertake the evacuation of homes under the conditions PG&E employees perceived at Rancho Cordova on December 24, 2008.
- PG&E provided no training that required employees to contact Fire Department, Police Department, and other emergency agencies, under the conditions PG&E employees perceived at Rancho Cordova on December 24, 2008.

6. Title 49, CFR §199.105(b), Drug Testing, and §199.225(a), Alcohol Testing and Pub. Util. Code §451:

Operators of gas systems are required to administer drug and alcohol tests for employees whose performance either contributed to an accident or cannot be completely discounted as a contributing factor to an accident. PG&E did not drug or alcohol test the leak investigator whose performance was critical and cannot be ruled out as a contributing factor to the explosion.

Key facts:

- A PG&E technician detected leaking gas near dwellings.
- The leak investigator arrived at the site, on Christmas Eve day, two hours and thirty seven minutes after dispatch.
- Alcohol or drugs cannot be ruled out as contributing factors in the leak investigators arrival time.

APPENDICES



**CONSUMER PROTECTION & SAFETY DIVISION
CALIFORNIA PUBLIC UTILITIES COMMISSION**

**APPENDICES TO
INCIDENT INVESTIGATION REPORT
ON
RANCHO CORDOVA
EXPLOSION AND FIRE**

**San Francisco, California
November 10, 2010**

APPENDICES

Appendix A	Rancho Cordova Police Department Report (public)
Appendix B	Sacramento Metropolitan Fire District Fire Report (public)
Appendix C	Interviews conducted on December 31, 2008 (public)
Appendix D	Interviews conducted on February 5, 2009 (public)
Appendix E	January 29, 2009 tests conducted at NTSB's laboratory (public)
Appendix F	March 11, 2009 tests conducted at NTSB's laboratory (public)
Appendix G	April 13, 2009 tests conducted at NTSB's laboratory (public)
Appendix H	PG&E's data request responses
Appendix I	Letter from US Poly Company to PG&E dated November 9, 2006
Appendix J	Letter from JMEagle to NTSB dated April 8, 2009
Appendix K	Letter from JMEagle to NTSB dated May 12, 2009
Appendix L	NTSB's Pipeline Accident Brief released on May 18, 2010 (public)
Appendix M	Timeline of events that occurred and actions taken on December 24, 2008